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(54) ELECTRIC FURNACES

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- The present invention relates to electric furnaces of the type provided with a crucible for melting metals and their alloys in an inert gas atmosphere or in vacuum.
- It has been previously proposed to melt highly reactive metals in electric furnaces, a melting crucible being placed in a hermetically sealed chamber in which a vacuum or a protective gas atmosphere is provided. Mounted on the chamber cover is the heating means which may be an electron-beam gun, a conventional arc torch or electrodes connected to an electric power source as is an electric arc furnace.
- Using said melting means it is possible to remelt billers and charge materials. A solenoid may be provided around the crucible for stirring up molten metal therein.
- The molten metal from the crucible is cast into a mould which is provided for the purpose in the furnace chamber or in an additional pouring chamber. In the latter case, the pouring chamber is connected to the furnace working chamber, and there is provided a pouring spout to convey the molten metal from the crucible into the mould.
- In previously proposed electric furnaces, a hermetically sealed external chamber is usually made of heat-resistant, anti-corrosive metals, for example stainless steels. The chamber is also provided with a water-cooled jacket. This accounts for the fact that the conventional furnaces are of a considerable size and require a large amount of expensive metal in their construction.
- The present of the vacuum chamber requires the use of special vacuum packings in the places where lead-ins of power cables into the crucible and solenoid are situated, as well as pipings supplying a cooling medium to the crucible.
- Servicing of contact junctions inside the furnace chamber is rendered difficult, and is likely to result in decreasing the reliability of the furnace operation.
- During a heat, evaporation of metal and volatile impurities occurs, which settle later as a deposit on the chamber walls and on the equipment disposed therein. It is necessary regularly to remove this deposit to obtain the required purity of metal.
- Cleaning of the chamber and equipment involves labour consuming manual operations, necessitating lengthy shutdowns of the furnace.
- An object of the present invention is to improve the design of an electric furnace in such a manner that the chamber where the vacuum or protective gas atmosphere is set up, could be directly employed as the melting space proper.
- According to the present invention, there is provided an electric furnace for melting metals and their alloys in a vacuum or in a protective gas atmosphere, comprising a crucible having a hermetically sealing cover supporting heating means, trunnion means carrying said crucible for tilting movement relative to a fixed pouring chamber and providing a connecting passage between the crucible and the pouring chamber, and trough means whereby molten metal can be poured

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from the crucible, when tilted, along the connecting passage and into a casting mould in said chamber, said crucible, connecting passage and chamber together constituting a hermetic enclosure adapted to be connected to an exhausting device or a source of protective gas.

On the crucible cover, there may be also placed a feed mechanism for an electrode if the furnace is equipped for electric arc melting.

An embodiment of the present invention will now be described with reference to the accompanying drawings in which:

Fig. 1 is a diagrammatic view of an electric furnace according to the invention, provided with arc melting equipment.

Fig. 2 is a corresponding cross-sectional view on the line AA of Fig. 1.

The invention is described below in relation to an electric arc furnace.

Referring now to the drawings the furnace comprises a melting crucible 1 (Figs. 1 and 2) which is essentially a vessel having an open top hermetically closed by a cover 2 and provided with a pouring spout 3. The crucible 1 is mounted on trunnions 4 for turning by means of a drive mechanism 5 and a gear train 6 serving to transmit the drive to the crucible 1.

The crucible 1 is connected to an exhausting device 7 or to a source of protective gas.

Mounted on the cover 2 of the crucible 1 is a mechanism 8 for feeding a consumable electrode 9 which is connected to a source of electric power. The present invention may also utilize other existing heating equipment, for example, an electron-beam gun or conventional arc torch provided on the cover 2.

When using the electrode 9, the hermetical sealing of the cover 2 is ensured by a packing 10.

Provided around the crucible 1 is a water-cooled jacket 11 and a solenoid 12 supplied with electric power for stirring up the molten metal in the crucible 1.

As shown in Fig. 2, pipes 13 of the jacket 11 and power cables 14 supplying electric current to the crucible 1 are disposed outside the zone of vacuum or gas chamber and are therefore not subjected to high temperatures, which is advantageous in increasing the efficiency of the furnace.

Hermetically connected to the melting crucible 1 by connecting passages are pouring

chambers 15 accommodating rotary tables 16 having placed thereon moulds into which molten metal is to be cast. The crucible 1, connecting passages and pouring chambers 15 together constitute a hermetic enclosure.

Pouring of molten metal is effected through the pouring spout 3 of the crucible 1 when it is being tipped along a pouring trough 17.

In the present embodiment, the molten metal is obtained in the crucible 1 by remelting the consumable electrode 9. Therefore, when employing other melting appliances, for example, an electron-beam gun, the feeding mechanism 8 may be adapted for retaining a billet to be remelted.

It is obvious that the furnace thus described can be also employed for melting a charge loaded into the crucible.

An advantage of the invention first of all consists in the fact that it simplifies the furnace design and allows an increase in the reliability of its operation, as well as in the productive capacity.

Another advantage of the invention resides in that it requires a smaller production area.

WHAT WE CLAIM IS:—

1. An electric furnace for melting metals and their alloys in a vacuum or in a protective gas atmosphere, comprising a crucible having a hermetically sealing cover supporting heating means, trunnion means carrying said crucible for tilting movement relative to a fixed pouring chamber and providing a connecting passage between the crucible and the pouring chamber, and trough means whereby molten metal can be poured from the crucible, when tilted, along the connecting passage and into a casting mould in said chamber, said crucible, connecting passage and chamber together constituting a hermetic enclosure adapted to be connected to an exhausting device or a source of protective gas.

2. An electric furnace as claimed in claim 1, wherein the heating means is a consumable electrode and means are provided for feeding the electrode into the crucible.

3. An electric furnace substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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